SIM-Lite
Architecture & Performance

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02/19/2008

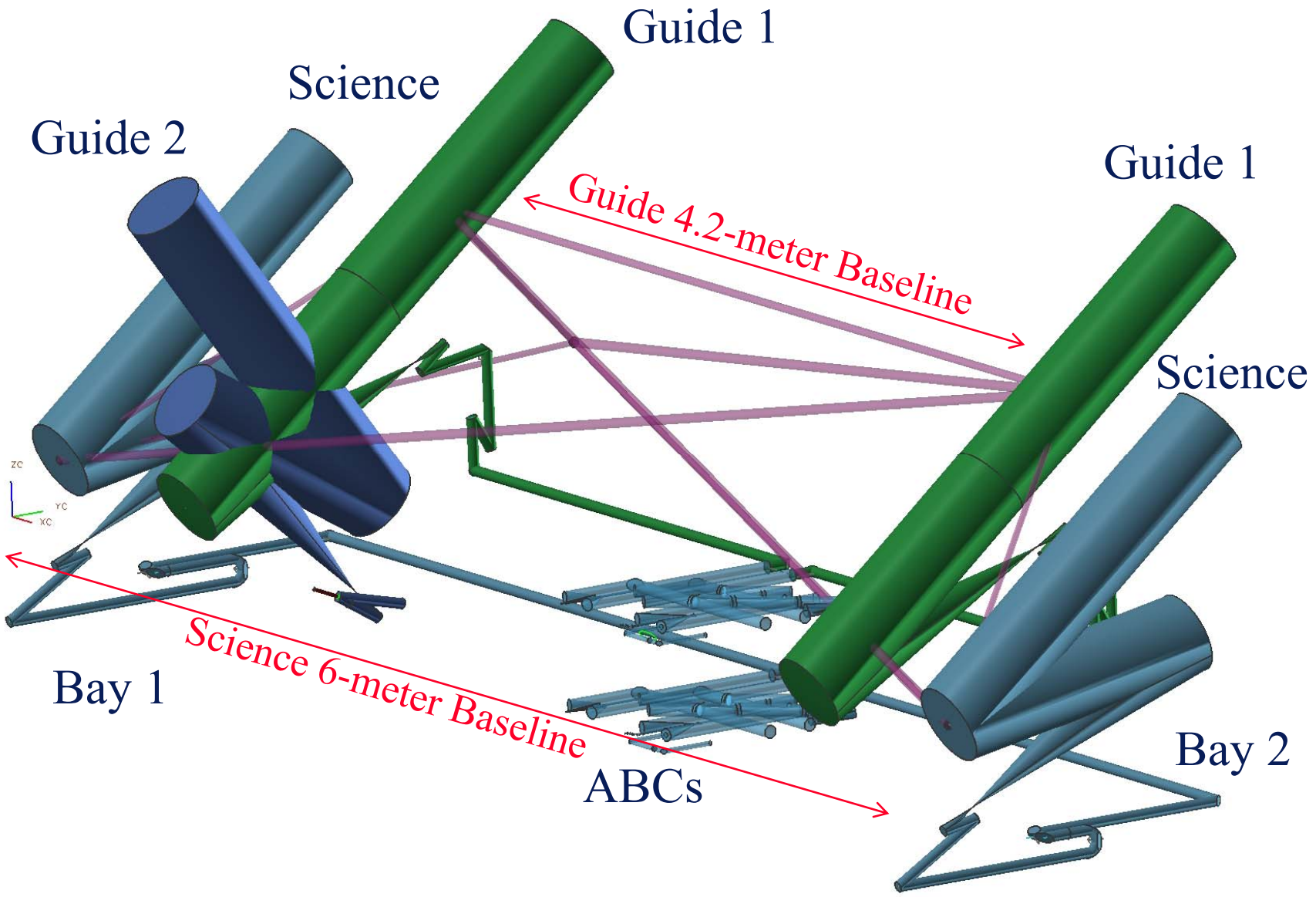
SIM-Lite – Objectives

- SIM-Lite is a new concept for a space borne astrometric mission.
- It will be located in a solar Earth-trailing orbit.
- SIM-Lite utilized technology developed for the Space Interferometry Mission PlanetQuest.
- The instrument consists of two Michelson stellar interferometers and a telescope.
- The first interferometer chops between the target star and a set of reference stars.
- The second interferometer monitors the attitude of the instrument in the direction of the target star.
- The telescope monitors the attitude of the instrument in the other two directions.

SIM-Lite – Predicted Performance

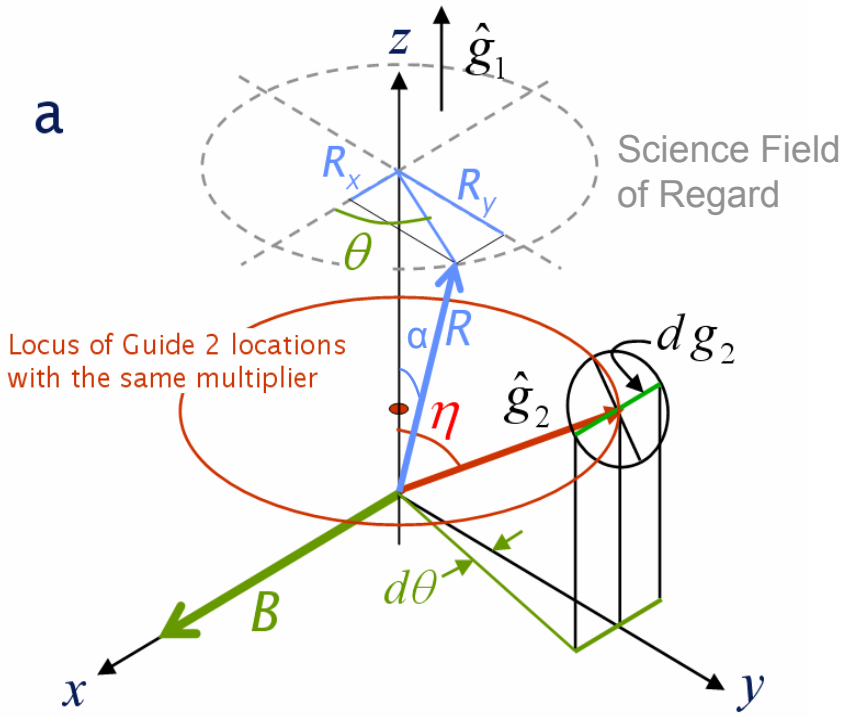
- SIM-Lite will be capable of one micro-arc-second narrow angle astrometry per visit, over a two-degree field of regard for magnitude 6 and brighter target stars.
- During the 5-year mission, SIM-Lite would search about 60 nearby Sun-like stars for planets of mass down to one Earth mass, in the Habitable Zone.
- SIM-Lite will also perform global astrometry on a variety of astrophysics objects, reaching 4 micro-arc-second absolute position and parallax measurement accuracy on objects brighter than 15th visual magnitude.
- As a pointed instrument, SIM-Lite will be capable of achieving 8 micro-arc-second astrometric accuracy on 19th visual magnitude objects and 10 micro-arc-second astrometric accuracy on 20th visual magnitude objects.

SIM-Lite – Optical Prescription



Guide 2 Telescope Multiplier

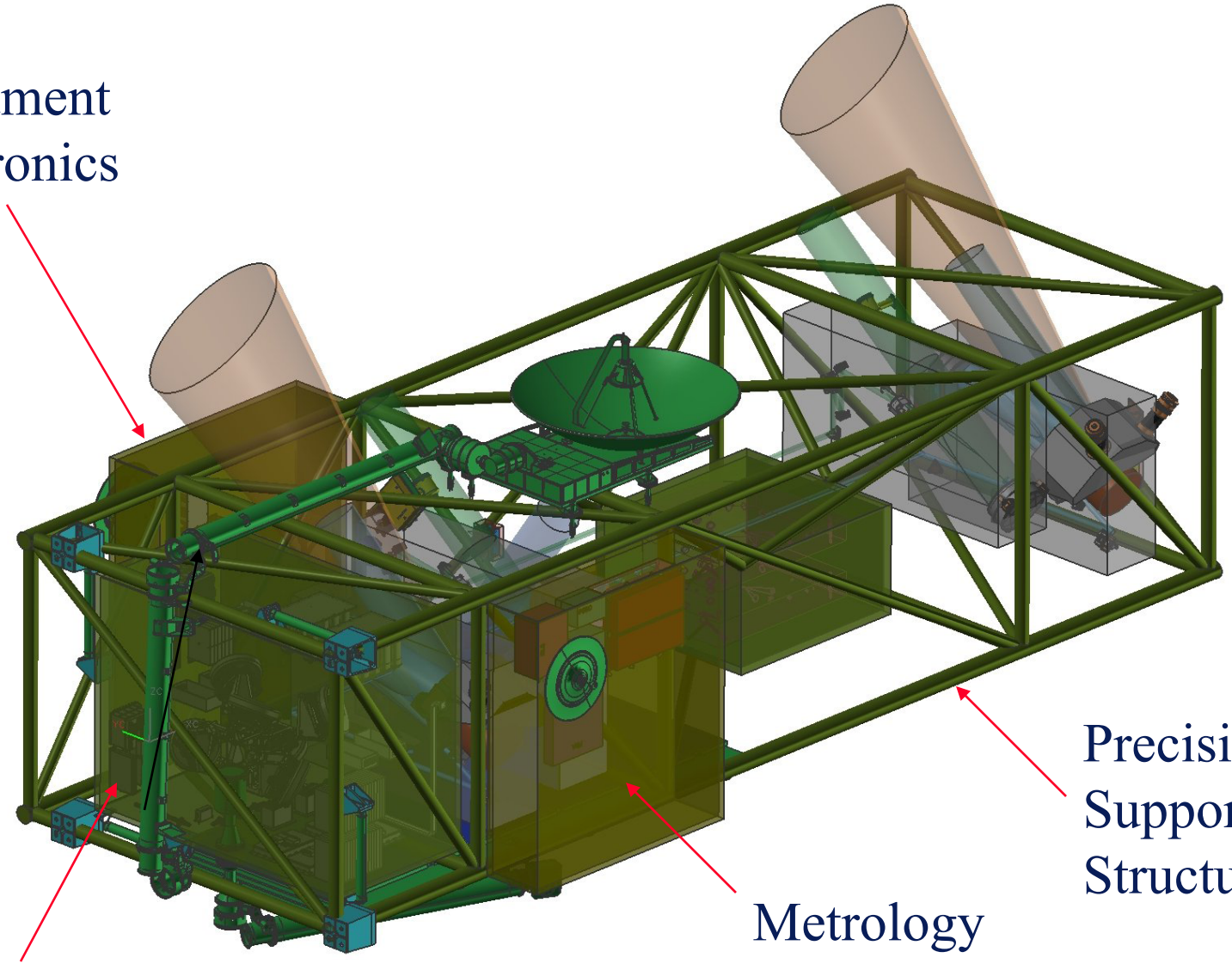
- "Guide 2" must track θ, the rotation of the interferometric baseline B around the Guide 1 star. M_{G2} is the Guide 2 multiplier for a Science field of regard (of radius α), centered around the Guide 1 star.



$$M_{G2} = \frac{1}{\sin\eta} \cdot \frac{4}{3\pi} \alpha_{Science}$$

- For an angle η ~ 90° between the Guide 2 and Guide 1 stars and a Narrow Angle science field of regard radius α ~ 1°, the Guide 2 multiplier is 0.0074.
- A 0.4μas sub-allocation to the Guide 2 Telescope of the 1 μas NA astrometric error corresponds to a 54 micro-arcsecond Guide 2 angle tracker.

SIM-Lite – Flight Configuration



SIM-Lite – Mission allocation

Task	Targets	Mission
Tier 1 (1Earth)	65 stars	46%
Tier 2	1050 stars	5%
Young Stars	67 stars	2%
Grid	44,000 tiles	9%
Quasars	50 quasars	1.5%
Wide Angle	8,300 hours	19%
S/C Slewing	61,100 slews	14%
Alignment/Cal	50 min/day	3.5%
Total	5 years	100 %

Conclusion

- Although SIM-Lite will not produce the amount of science that SIM PlanetQuest would, a large portion of it, arguably 50%, could be achieved.
- On the other hand, SIM-Lite (with a cost below $1B) will be a more affordable mission in which NASA can invest in the next few years.